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Proposal: CAN 74

30 July 1957

STATEMENT OF ADDED WORK RESEARCH AND DEVELOPMENT OF SYSTEM IV

The Contractor has had to supply added engineering services and material to alter the basic design of the system described in the original Statement of Work by substituting lock-on techniques for continuous scanning techniques. The resulting changes in scope and magnitude of the work are reviewed as follows:

1. System Modifications

This involved a study and evaluation effort aimed at establishing specifications and requirements for a "lock-on" superheterodyne system. This work was carried on for a period of one and one-half months during which time six engineers were assigned full time. Tasks, in particular, given consideration during this period were:

- a. Formulation of receiver design necessary to provide adequate "lock-on" capabilities.
- b. Formulation of logic in audio and video recording equipment to provide for adequately processing data in a "lock-on" system.
- c. An intensive investigation of feasible design approach for receiver tuning heads.

2. Design Modifications

- a. Modifications and Receiving Equipment for Bands 2 through 7

The modifications for receiving equipments in Bands 2 through 7 were those factors which pertain to providing a lock-on feature. Specifically, this involved the design development of an adequate servo

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Modification and Receiving Equipment for Bands 2 through 7 (Cont'd)

system, designs for suitable gear mechanisms, providing adequate frequency readout, and design and development of circuitry inherently associated with the "lock-on" mechanism such as the AGC, the AFC, and the threshold circuitry. In September of 1956 the antenna scan concept was changed by the customer. While not a major change, some additional R & D effort was required to incorporate this change.

b. Design Changes in Band 1 Receiving Equipment

In addition to the changes given above for Band 2 through 7, the Band 1 receiver concept was changed considerably from that given in the earlier technical exhibit. The earlier technical exhibit provided for only one receiving equipment in this band. The customer indicated during the system evaluation period that the Band 1 receiver should be covered in two separate ranges. The design of the Band 1 receiving equipment was somewhat more involved than for the other receivers, in that the design objective was to provide both channels in the same volume and weight as required by each of the other receiving channels.

c. Design Changes in Receiving Equipments for Bands 8 through 10

Bands 8 and 9, described in the earlier technical exhibit as a special dual channel receiver, was eliminated and the frequency coverage was provided by crystal video receivers in three frequency ranges. The concept is basically simpler but the scope of the work has been about the same. In December of 1956 an additional requirement was applied to design and develop a CW capability for these equipments.

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d. Design Changes in Video Programming Equipment

In the earlier technical exhibit the requirements for programming equipment were almost non-existent. Only a simple exclusion matrix had been proposed for use with the camera-indicator. With a "lock-on" system it was necessary to provide an order of magnitude more in sophistication for such a programmer. Adequate means had to be provided for properly gating video from all of the channels, establishing a program for handling video output data from all of the receiving channels, and establishing the routine for the recording operation itself.

e. Design Changes In Audio Programming Equipment

In the earlier technical exhibit only a bare minimum of auxiliary information was recorded on the tape. With the incorporation of "lock-on" techniques, it became necessary to provide means for the recording of AGC information from each of the superheterodynes and to provide an identification channel which carried in digital form, information relating to: time, frequency of each receiver, "lock-on" status of each receiver, antenna in use by each receiver, and a count of the photographs taken.

f. Design Changes in Receiver Equipment

Considerably more complexity exists in the present indicator than that specified in the earlier technical exhibit. The specification for an extended recording time provided by a raster-type presentation involves more circuitry than that required in a simple sweep. Additional circuit design development is required, in that four different sweep speeds are required. Additional circuit work was involved in the inclusion of markers for calibrating the sweeps.

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g. Design Changes in Antennas for Bands 8 through 10

In December of 1956 the specifications for the antennas for Bands 8 and 10 were altered. In addition to the work directly concerned with the design and development of these antennas, additional work was necessary to provide for handling design problems arising from the necessity to operate Bands 1, 2, and 3 from the Band 2 antennas.

h. Design Changes in the System Rack

The change to "lock-on" techniques resulted in a much more complicated system than that described in the earlier technical exhibit. Cabling problems became considerably more involved because of the much larger number of inter-connections involved in the system. For example, each receiver requires many more connections to effect such things as transfer of: frequency information, "lock-on" information, AGC, etc., as compared to the connections required for power wiring only.

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